



# Institute for Laser Science and Applications



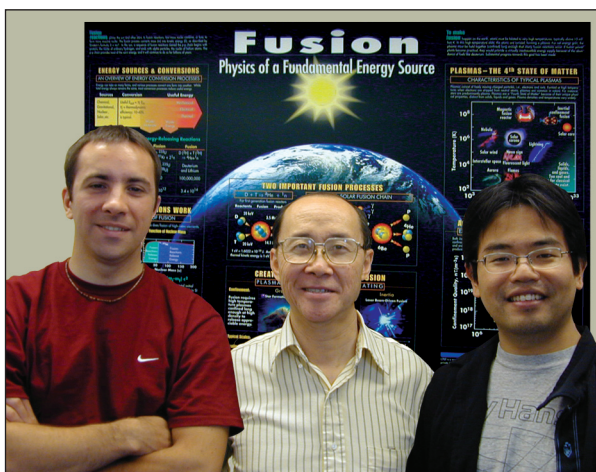
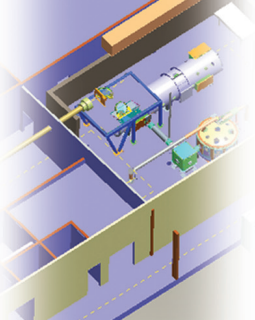
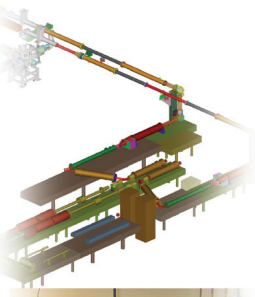
Created in 1996, the mission of the Institute for Laser Science and Applications (ILSA) is to foster university collaborations that have the potential to enhance the vitality of high-energy-density (HED) science research with lasers at LLNL. ILSA supports academic collaborations on the application of high-intensity, high-energy lasers in areas that include laser-plasma physics, the study of matter under extreme conditions, and ultra-short, laser-pulse interaction physics.



As part of its mission, ILSA oversees access for students and faculty to LLNL experimental laser facilities, such as the Jupiter laser facilities (previously referred to as Janus) and, eventually, the National Ignition Facility. University involvement in these laser facilities assists and enhances the scientific environment at LLNL and creates a forward-looking research effort that provides strategic benefit to both the scientific and the university communities.



ILSA's outreach to the university community includes supporting the programs managed by LLNL's University Relations Program as well as the organization of conferences and workshops in topical areas of common interest to the HED science community. ILSA's work is carried out in collaboration with LLNL colleagues from various programs having HED science research topics and with faculty colleagues from University of California



*Professor Edison Liang from Rice University accompanied by grad student Dan Kocovski (left) and postdoc Kiochi Noguchi (right), took a six-month sabbatical at LLNL studying astrophysics applications of intense lasers.*

campuses and other universities with unique HED science capabilities (theoretical, computational, and experimental).

## ILSA HED Science Research

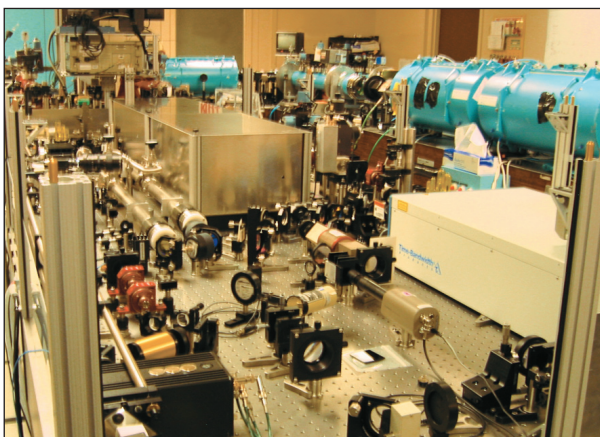
An important element of ILSA's research in high-intensity, laser-plasma interactions is the "Exploratory Research in the Institutes" (ERI) category within LLNL's Laboratory Directed R&D (LDRD). Both of ILSA's current ERIs include use of the Jupiter laser facilities with a minimum of one faculty co-PI. The two ERI projects are the Fast Ignition Concept Exploration where the principal investigator is LLNL's Andy Mackinnon, and the Plasmon Density of States, where the co-principal investigator is LLNL's Siegfried Glenzer. Both Andy Mackinnon and Siegfried Glenzer are research scientists within the Livermore Lab's Inertial Confinement Fusion program that resides inside the National Ignition Facility directorate.

Another component of ILSA's research are the numerous Research Partnerships managed by LLNL's University Relations Program. These academic research partnerships include such opportunities as Faculty Sabbaticals, the UC Office of the President Collaborations, and the University Education Partnerships Program (UEPP). UEPP supports Ph.D. student dissertation studies that are aligned with the mission needs of LLNL. The dissertation studies of particular interest to ILSA are those that include experimental activities and theoretical/computational modeling that will enhance the quality of HED science research with ultrahigh intensity lasers at LLNL's Jupiter laser facility and eventually NIF.

## ILSA Sponsorship of Workshops

Because of ILSA's support of HED research throughout the U.S. academic community, ILSA is part of a multi-university Fusion Science Center for Extreme States of Matter that is centered at the University of Rochester (<http://fsc.ile.rochester.edu>). The UR Fusion Science Center is funded at approximately 1M\$/year for 5 years by DOE's Office of Fusion Energy Sciences (OFES). ILSA's role in the Center includes helping organize workshops and summer schools for graduate students, such as the 2005 Summer School in HED Physics. The 2005 HEDP Summer School took place in August, 2005, at the UC Berkeley Clark Kerr Campus.





*Unique OPCPA front end added to Janus.*

Previous workshops co-sponsored by ILSA include the Short-Pulse Laser Matter Computational Workshop (<http://ilsa.llnl.gov/lasermatter/>) and the International Conference on Ultrahigh Intensity Lasers (<http://www.llnl.gov/icuil/>). The Computational Workshop concentrated on the computational and theoretical aspects of short-pulse laser-plasma interactions, and the Conference on Ultrahigh Intensity Lasers brought together in one venue both the developers and users of the latest ultrahigh intensity laser technology to discuss critical issues related to furthering this technology.

### **ILSA, University of California and HED Science**

ILSA was involved in the University of California-sponsored 2005 Forum on High Energy Density Science and Ultrafast Science. Participants represented SLAC, LLNL, LANL, LBNL, and UC campuses. The forum was a response on the part of the University of California Office of the President to explore opportunities that could help define the direction of these two fields through the formation of alliances among the UC campuses and UC managed national laboratories. The outcome of the forum will be the necessary background information to help create a UC plan for the next few decades of research in High Energy Density Science and Ultrafast Science.

As stated by UC, "This plan will be used to generate new funding for programs involving multi-campus (University and National Laboratories) collaborative projects. It is expected that these projects, involving graduate students, postdoctoral fellows and principal investigators, will be the fundamental elements of a campaign to keep the UC campuses and labs at the forefront of High Energy Density Science and Ultrafast Science for foreseeable future. Therefore, the goal is to develop one or more major initiatives with the State and Federal Governments as well as private foundations, to fund research outlined in the plan."



*Titan laser added to the LLNL Jupiter facility.*

### **ILSA, LLNL and HED Science**

HED science has been identified as one of the thematic planning areas for LLNL's long-term Science & Technology (S&T) investment strategy. HED S&T along with Stockpile S&T form the cornerstones of the Laboratory's nuclear weapons (stockpile stewardship) mission. Thus HED S&T is an integral component of the Lab's national security missions (stockpile stewardship, nonproliferation, and homeland security). By combining the existing laser capabilities within LLNL's Jupiter laser facility with the future capabilities of the National Ignition Facility, the Laboratory will continue to be the provider of unique, world-class S&T capabilities in HED science.

Such HED S&T capabilities will attract researchers not only from national laboratories but from universities as well. The role of ILSA will be to help nurture the HED S&T collaborations between LLNL researchers and academic researchers. Starting with LLNL's Nova laser facility, there has been an active university use of the Laboratory's unique high-energy, short-pulse laser facilities. The academic use of the Jupiter laser facilities will provide a bridge for connecting the previous Nova-use program to a future university-use program with NIF. The next five years will see the completion of the NIF construction project leading to ignition and HED science experiments.

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